2020-01

An interdisciplinary approach to improving the quality of life in Postural Orthostatic Tachycardia Syndrome: A case study

Turner, C

10.1123/cssep.2020-0010
Case Studies in Sport and Exercise Psychology
Human Kinetics

An interdisciplinary approach to improving the quality of life in Postural Orthostatic Tachycardia Syndrome: A case study

An interdisciplinary approach to improving the quality of life in Postural Orthostatic Tachycardia Syndrome: A case study

Abstract

Postural Orthostatic Tachycardia Syndrome (POTS) is a debilitating condition affecting the autonomic nervous system that causes a series of symptoms such as blurred vision, brain fog, chest pain, headaches, shortness of breath, fatigue, syncope and rapid heart rate. These symptoms can lead to diminished daily activity, daytime fatigue, poor sleep quality, and increased suicidal tendencies. Among the physical symptoms, POTS patients present decreased quality of life (QOL), increased prevalence of depression and elevated anxiety (Anderson, et al, 2014). This case study documents an interdisciplinary approach to treating a 39-year-old female POTS patient with an eight-week intervention program and a further four-week follow-up. The intervention investigated the combined effects of Functional Imagery Training (FIT) and physical exercise on the patient's QOL. Following completion of the program, the subject improved in all four QOL components and this change was maintained over time when compared to baseline measures. The program demonstrated that high levels of exercise adherence beyond the intervention can be achieved when combining FIT and exercise, regardless of the exercise intolerant characteristics presented by a POTS patient.

Keywords: postural orthostatic tachycardia syndrome, quality of life, exercise, functional imagery training

Overview of POTS

Postural Orthostatic Tachycardia Syndrome (POTS) is a condition that affects 0.2% of the population, resulting from disturbances in the autonomic nervous system, presenting as a heterogeneous group of disorders with similar characteristics. The constellation of symptoms that arise as a result of this condition include blurred vision, brain fog, chest pain, headaches, severe fatigue and a rapid heart rate (HR) (Anderson, Lambert, Sari, Dawood, Esler et al., 2014; Raj, 2013). These symptoms make everyday living extremely challenging for POTS patients, with quality of life (QOL) severely impacted (Flack & Fulton, 2018; Moon, Kim, Byun, Sunwoo, Lim et al., 2016). Symptoms often occur when patients stand upright, resulting in inadequate vasoconstriction of blood vessels (particularly in the legs and core), due to muscle deconditioning and/or peripheral denervation. At present all medicines used to treat POTS have concerning side effects, some of which may exacerbate symptoms (Raj, 2013). Research indicates that short-term exercise (Galbreath, Shibata, VanGundy, Okazaki, Fu et al., 2011) could alleviate symptoms, and cognitive behavioural therapies including goal setting (Kizilbash, Ahrens, Bruce, Chelimsky, Driscoll et al., 2014) would be specifically beneficial for managing POTS and improving QOL.

Context and Research Team

As part of a larger scale trial examining the benefits of exercise and Functional Imagery Training (FIT); an approach that aims to enhance self-efficacy and intrinsic motivation by exploring tangible goals, a potential participant was identified as having POTS. Due to the multitude of health-related complications including cardiac disorders and the research teams' prior lack of POTS knowledge, this participant (R.L.) did not meet the entry criteria because of her current health condition. The second author suggested the possibility of an adapted study, specific to R.L.'s needs if

an interdisciplinary team could be formed and ethical clearance granted. The study aimed to investigate if FIT plus exercise improves the QOL in a patient diagnosed with POTS.

The project was promptly approved by the institutional ethics committee on the proviso that a first-aider be present during each exercise session. A case study project was then offered as an alternative to provide individual support necessary for POTS. Prior to the initial meeting a detailed information sheet and consent form explaining the protocols of the study was emailed to the subject. This also included a clear statement explaining FIT sessions would be audio recorded.

In the weeks pending ethical clearance, an interdisciplinary team of nine formed to devise and execute the treatment intervention. The team was brought together and managed by the second author, a chartered psychologist (British Psychological Society; Division of Academics, Teachers and Researchers) who directs a degree in sports rehabilitation and supervises final year projects. The second author will be referred to as ‘the psychologist’. The psychologist has completed >500 clinical hours of Motivational Interviewing (MI) training including fidelity checks and is a FIT practitioner. A trainee psychologist studying for a Ph.D in psychology and FIT practitioner was responsible for data collection and fidelity checks to add objectivity to the approach.

Two certified sports therapists (Sports Therapy Organisation) with a combined experience of 32 years, who own private practices, and are trained in special populations (e.g., cardiovascular disease) agreed to assist. The first author, one of the sports therapists, took responsibility for project logistics, such as timetables and general communication between all parties. Three conditioning coaches were undergraduate students supervised by a National Strength and Conditioning

Association (NSCA) Coach, who is also lecturer in the subject. The medical doctor (National Health Service), a Consultant in Acute and General Medicine, acted as a sounding board and is a leading specialist in POTS.

The collaborative team realised the potential for adopting an interdisciplinary approach and weekly meetings evolved to share information and practice, although not all members could always attend. Collectively, the team developed an evidenced-based intervention to improve health and psychological factors. General exercise has shown to benefit numerous health conditions such as: type 2 diabetes, depression, some cancers and heart disease (Agarwal, 2012; Pal, Radavelli-Bagatini, & Ho, 2013), and specific studies (Fu, VanGundy, Shibata, Auchus, Williams et al., 2011; Shibata, Fu, Bivens, Hastings, Wang et al., 2012) provide guidance for working with POTS patients. For psychological support, goal-centred motivational imagery is beneficial for behavioural change and motivation to goal adherence (Andrade, Khalil, Dickson, May, & Kavanagh, 2016). As the psychology practitioners were trained in FIT, it was a natural starting point to explore motivation before focusing on tangible goals. It was therefore the aim to merge physiological and psychological interventions to create an interdisciplinary approach.

Philosophical Application

The interdisciplinary nature of this study involving an amalgamation of both psychological and physiological practices meant that we required a joint philosophical approach. Therefore, recognising there could be conflicting approaches, during the first team meeting the psychologist outlined the holistic stance; to assess the individual not the POTS diagnosis, which was accepted by all practitioners. Collectively, we accepted that there may be similarities between all POTS patients, however, we attempted to treat R.L. as a unique individual by assessing and treating

based on findings alone, rather than making assumptions. Each finding drove our next step, and we conducted a weekly progress meeting to check practice and share information, which R.L. was invited to attend and provide input. Therefore, aligned with Rorty's (1991) philosophical suggestions, our findings developed with our contextual learning and treatment.

Individually, the psychologist adopted a humanistic cognitive approach, which gave R.L. the opportunity to learn imagery through cognitive methods after an initial interview. This approach could be seen as a paradoxical philosophy, but using person-centred FIT (Rhodes, May, Andrade, & Kavanagh, 2018; Solbrig, Whalley, Kavanagh, May, Parkin et al., 2019) gives the participant the autonomy to learn imagery to foster intrinsic motivation. The sports therapists, conditioning coaches and medical consultant were ultimately reductionist in their treatment due to the biological nature of their methods. Where possible R.L. was given the autonomy to make choices, therefore, we aimed to engage her in discussions about, for example, exercise selection. Collectively we were pragmatic (cf. Bhaskar, 2013) in nature, acknowledging that we are operating in different contexts.

Case Overview

R.L. is a 39-year-old, Caucasian female who works as a secondary school teacher and is a single mother of three teenage boys. During a routine exercise session at her gym in February 2018 she collapsed and was later diagnosed with POTS in March 2019. Prior to this event R.L had recently undergone surgery for carpal tunnel syndrome, however this condition was later found to be Hypermobile Ehlers-Danlos syndrome (HEDS) - synonymous with POTS. Before the condition developed, R.L. had previously led a very active lifestyle, attending exercise sessions four to five times per week, including high intensity group exercise and personal training

sessions. There were even plans put in place to undergo training to become a studio instructor and teach aerobic exercise classes. After collapsing her life quality deteriorated substantially. She continued to feel unwell for prolonged periods of time, stating that her ability to lead a "normal life is unattainable".

Receiving the correct diagnosis took many "frustrating months" due to ongoing misdiagnosis from her general practitioner (GP). Her initial GP underestimated the severity of her symptoms, firstly diagnosing fainting with low blood sugar levels suggesting she should "eat some cake" to improve symptoms. Lack of POTS specific understanding is common amongst medical professionals (Kavi, Gammage, Grubb, & Karabin, 2012). Eventually, at her own financial expense and 13 months of "uncertainty" a diagnosis of POTS was confirmed by a specialist consultant. The consultant proposed the condition had manifested due to recent surgery, leaving her vulnerable to autonomic dysfunction. Medications (Midodrine and Fluoxetine), salt, B2, B12 and probiotics were prescribed leading to slight improvements of her condition, albeit with her still feeling fatigued and lacking motivation towards performing physical activity. She demonstrated an understanding that exercise is beneficial for POTS, however conceding "whilst working full-time, work is all I can manage". She expressed fears about losing her job due to long-term absence, losing consciousness, and an inability to perform routine tasks as a consequence of suffering from extreme fatigue.

Case Formation

To treat the person not the condition, R.L. was assessed at week 0, now referred to as baseline, before a treatment plan was collectively put into action. The assessments are reported in order of occurrence, summating in overall case formation which was then developed into a personalised intervention.

Measure

Upon meeting R.L. the study design was recapped, and any questions answered. The WHOQOL-BREF (see Gholami, Jahromi, Zarei, & Dehghan, 2013) was then administered at baseline with score available in Table 2. The World Health Organisation (Whoqol Group, 1995, p. 1403), defines QOL as:

> An individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns.

The WHOQOL-BREF questionnaire consisting of 26 self-report items was used to assess domain specific and two overall QOL items. Individual items are scored 1-5 and each domain presents a range of 0-100; the raw scores have been transformed according to manual guidelines (World Health Organisation, 1997). The four domains: physical health, psychological health, social relationships and environment (World Health Organisation, 1997) factorially vary. Physical health questions seek to evaluate an individual’s ability to perform daily tasks, energy levels and fatigue, mobility, pain and discomfort, sleep and rest, dependence on medicine and work capacity. Psychological health questions assess the level of positive feelings, negative feelings, self-esteem, ability to think and concentrate, personal beliefs, body image and appearance. Social relationship questions are in relation to personal relationships, social support and sexual activity. Finally, environment questions consider aspects such as: home environment, financial resources, access to health and social care and opportunities for recreation.

FIT

FIT is a person-centred methodology that utilises the skills from MI, integrating imagery to enhance self-efficacy and foster intrinsic motivation. MI is a

client-centred counselling technique that aims to reduce resistance and resolve ambivalence towards change using specific systematic processes (cf. Miller & Rollnick, 2012). When compared to a control group, MI has been found to be significantly better for weight loss (Smith, Heckemeyer, Kratt, & Mason, 1997), but not as effective when compared to an imagery (FIT) group (Solbrig et al., 2019). Due to the complex motivational needs of POTS patients, FIT can be adapted to support change based on individual cases.

The fundamentals of FIT operate within the spirit of MI and the four processes of the interview must be adhered to; engage in conversation, focus on goals, evoke change, and plan for progress. Individuals are supported using skills such as affirmations when they discuss possible solutions to obstacles, further developing self-efficacy. Using Paivio's (1985) motivational and cognitive imagery approach, FIT explores goals by discussing intrinsic values and goals, potential obstacles, personal strengths and overcoming struggles, and future success. At each stage of discussion, the individual is taught how to use multisensory imagery by periodically layering each sense (see Williams, Cooley, & Cumming, 2013) to enhance the experiences and create feedback from discussion (Lang, 1979). Specifically, imagery focuses on the multisensory experience of goal achievement to foster self-efficacy, and immediate action-based implementations (Duckworth, Kirby, Gollwitzer, & Oettingen, 2013) which could be beneficial for managing POTS and adhering to exercise. Progressive interview questions like; "what would it be like in six months if you did not change your exercise routine", are later compared to; "imagine a future version of you in six months who did stick to the exercise program. What does that look like? How does it feel? What can you do right now to support a future you?".

FIT Interview

The initial FIT interview is both an assessment and intervention as it involves motivational imagery training. The meeting was audio recorded (and later fully transcribed) for potential client quotes. The audio was shown to other FIT practitioners for training purposes and to check fidelity, which was later reported as 'high'. The transcription was highlighted to show the best fit from the answers given. All quotes were checked with R.L. to ensure meaning was accurate during later interpretation and brief quotes approved by R.L. for publication.

The psychologist began by asking open-ended questions about lifestyle to engage in conversation, progressing to focusing on goals, and then the difference between R.L.'s life now and what she expected it would be like at this point. As the interview continued, imagery was used to contrast between current self and future achievements. To train multisensory imagery, especially motivation specific achievement goals (Paivio, 1985), layered stimulus response training (LSRT; Williams, Cooley, & Cumming, 2013) was used to enhance vividness and controllability. Through the FIT process R.L. revealed how the opportunity to enrol on to a study which included exercise, physical therapy and psychological support was the "final roll of the dice", and this was the "most important step in regaining her identity".

R.L. described a desire and need to change, giving reasons such as: "I have to try. I feel guilty of not being able to go out with my children", and a need to be fit and healthy to keep her job and provide for her family. The interview also revealed a loss of confidence in her physical appearance, lack of self-esteem, and an admission that "with POTS life would never be the same again" and was "pretty crap at present". In spite of this, there was an underlying tone of defiance towards her condition, wanting

to gain “some form of control” to improve her QOL. Towards the end of the session, R.L. set a goal: “I would like to jog continually for five minutes and maybe a long-term goal is to run for 5K” and suggested some lifestyle modifications such as “walking 10,000 steps” daily. Jogging was the primary goal, which was imagined through a set of controllable scenarios, and multisensory LSRT delivered to again enhance vividness and controllability. Using a scale from 0 (no image) to 5 (as vivid as having achieved the goal), R.L. was asked to rate her imagery at strategic points, scoring >3 at each. A cue was linked to a daily activity, in this case before taking the first sip of coffee, whereby imagery is activated throughout the day to imagine the feeling of success from jogging for five minutes followed by a small implementation strategy. Immediately after this session the physical assessment occurred.

Physical Assessment

The physical assessment determined areas which required improvement through corrective exercise and physical therapy. Assessments included: range of motion (RoM), flexibility, functional movement, muscle activation and special tests. The findings of the physical tests revealed: posterior pelvic tilt, weak: gastrocnemius, gluteus maximus, hamstrings, quadriceps and lower back, limited external rotation at the acetabular femoral joint, painful/stiff lumbar region and sacroiliac joint with hypermobility in the glenohumeral joint. The assessment lasted for 33 minutes, with no exercise occurring at baseline. The results from the assessment went on to develop the physiological intervention delivery. A retest of these assessments did not formally occur, but observations were made based on posture, balance and movement quality which then informed the exercise program.

Developing and Delivering the Interventions

It was not until after completion of the WHOQOL-BREF, FIT interview, and physical assessments at baseline that the interdisciplinary team had enough information to develop a plan for R.L.'s needs. We decided to run combined conditioning and physical therapy, and supportive imagery sessions for eight-weeks following similar exercise protocols (Richardson, Nordon-Craft, & Carrothers, 2017) and FIT delivery (Rhodes et al., 2018) timelines. At week eight the WHOQOL-BREF would be conducted a second time. At that point, the intervention stopped, and no support provided. Four-weeks later (12-weeks from the first exercise session) we asked the participant to complete the WHOQOL-BREF a final time.

The general plan was to deliver FIT booster sessions for the first 15-minutes, followed by aerobic conditioning for up to 30-minutes and corrective exercises lasting approximately 15-20 minutes. Although this time was set aside for delivery, we were pragmatic in our approach as there are many obstacles at play.

Psychological Intervention

From a psychological perspective exercise alone has been shown to decrease depression and anxiety, while enhancing body image and confidence (De Moor, Beem, Stubbe, Boomsma, & De Geus, 2006; Campbell & Hausenblas, 2009). Furthermore, exercise is beneficial in negating social withdrawal and low self-esteem whilst presenting opportunities for enhanced self-efficacy and social interactions (Sharma, Madaan, & Petty, 2006). Although there are many benefits associated with general exercise, individuals with POTS often lack motivation to start, with the primary concern of becoming unconscious during training (Kizilbash et al., 2014). Research (Tito & Hess, 2017) delivering exercise and assessing QOL has reported a decrease in both physical and psychological domains, but an increase in overall QOL.

To complement the physical exercise and mobility support intervention, a FIT booster session was delivered weekly which aimed to support motivation to exercise throughout the 8-weeks.

FIT Booster. The FIT booster sessions were conversational, focusing on vividness and controllability of images and were used to monitor goals, reporting findings back to the research group. In weeks 1 and 2, R.L. reported using imagery infrequently as her thoughts were on occasion negative, such as fainting during exercise. A thought parking strategy was implemented whereby R.L. recognises a negative thought and then changes the focus to feelings of accomplishment when she achieves her initial running goal. All imagery regardless of positive or negative outcomes were praised for use, supporting self-efficacy by following the imagery process. During week 3 imagery use was reported as more frequent and controllable, aligned with cue use, and the goal changed to a 10-minute run. By week 4 R.L. was using imagery multiple times daily with the original cue and adaptions such as "when walking the dog, I image running 5K with my son, and how that accomplishment would feel, and what he would say". This goal and cue adaptation occurred for the remainder of the intervention, with the psychologist inputting very little towards the end, merely adding prompts to add a sensory layer where necessary.

Physiological Intervention

Exercise can be particularly beneficial as it has been shown to address many of the common issues that make POTS so debilitating. It is cost effective, simple to implement and has minimal side-effects (Fu & Levine, 2018). Exercise improves the body's skeletal pump through strengthening the extremities and core, thus improving venous return. It has been found effective in increasing blood volume, ventricle size and baroreflex sensitivity. This can improve stroke volume, vasoconstriction and

pulmonary circulation which are all critical to negating the symptoms of POTS (Conner, Sheikh, & Grubb, 2012; Galbreath et al., 2011; Fu & Levine, 2018). Winker, Barth, Bidmon, Ponocny, Weber et al. (2005) found that following a three-month running program involving Austrian soldiers, 10 out of 16 who had previously experienced dizziness with tachycardia upon standing had a complete recovery from orthostatic intolerance. The control group, who did not jog, reported a resolution of symptoms in just 1 out of 11 soldiers. Considering case studies, there have been projects (e.g., Richardson et al., 2017) which implement specific exercise protocols to treat POTS by monitoring HR and setting tangible targets that motivate exercise adherence, enabling participants to return to full work duties.

For replication purposes exercises were selected by R.L and the conditioning coach in unison from a battery of suggestions in Richardson et al. (2017) on the day of training. Table 1 outlines all completed exercises which include actual rate of perceived exertion (RPE; Borg, 1982), exercise selection, duration, rest and observational notes. Principles of training, in particular frequency and intensity were adopted from Fu et al. (2011), however in contrast we did not incorporate a semi-recumbent only approach at the start.

Table 1. Exercise Training Program including RPE and Observations

Week 1	**Duration (sets/reps/time)**	**Rest Interval**	**RPE**	**Observations**
Jog	3-mins		15	Speed 6.5 KMPH; comfortable.
Lower Trunk Rotation	2 x 12 reps	30s	10	
Bridge	2 x 15s	30s	14	Limited glute activation. Hamstrings dominant.
Abdominal Curl	2 x 8 reps	30s	15	
Week 2				
Jog	5-mins		15	Speed 6.5 KMPH. Felt faint; 15-mins recovery.

Lower Trunk Rotation	3 x 12 reps	30s	10	
Bridge	3 x 15s	30s	14-15	Improved glute firing.
Abdominal Curl	3 x 8 reps	30s	15	
Weeks 3-4				
Jog	10-mins		15-16	Speed 6.5 KMPH. Felt steady was able to talk throughout.
Bridge	3 x 12 reps	30s	14	
Side Plank	3 x 15s	30s	15	
Hip Abduction	3 x 8 reps	30s	13-14	Pain in left hip; stretched in adduction to resolve.
Plank on Elbows	2 x 20s	30s	15-16	
Abdominal Curl	3 x 10 reps	30s	15	Fatigued in last set.
Weeks 5-6				
Jog (week 5)	15-mins		15	Speed 6.5 KMPH continuous.
Jog (week 6)	20-mins		15-16	5-mins at 7.8 KMPH, followed by 15-mins at 6.5 KMPH.
Stationary Bike	5-mins		16-17	Interval; 10s at 100+ RPM followed by 20s at 60 RPM; repeat until time elapsed.
Sit to Stand	3 x 12 reps	30s	14-15	
Seated Shoulder Press	3 x 12 reps	30s	14-15	Using 3KG dumbbells.
Dumbbell Bench Press	3 x 12 reps	30s	13-14	Using 4KG dumbbells.
Bridge	3 x 12 reps	30s	14-15	
Side Plank	3 x 20 secs	30s	14	
Abdominal Curl	3 x 12 reps	30s	15	
Weeks 7-8				
Jog	20-mins		15-16	5-mins at 7.8 KMPH, followed by 15-mins at 6.5 KMPH.
Stationary Bike	5-mins		16-17	Interval - 10s at 100+ RPM followed by 20s at 60 RPM. Repeat until time elapsed.
Sit to Stand	3 x 8 reps	30s	15-16	Holding 5KG kettlebell in both hands.
Hip Abduction	3 x 8 reps	30s	14-15	With resistance band.
Seated Shoulder Press	3 x 8 reps	30s	15-16	Using 5KG dumbbells.
Arm Curls	3 x 8 reps	30s	15-16	Using 4KG dumbbells.
Dumbbell Bench Press	3 x 8 reps	30s	15	Using 6KG dumbbells.
Reverse Dip	3 x 30s	30s	15-16	

Bridge	3 x 12 reps	30s	15
Abdominal Curl	3 x 12 reps	30s	15

Note. reps = repetitions; s = seconds; mins = minutes; KMPH = kilometres per hour; RPM = revolutions per minute; KG = kilograms.

In conjunction with supervised exercise sessions, a home-based program consisting of two sessions per week, with at least 48 hours rest between sessions. The aim of these exercises was to develop core, shoulder and lower extremity strength, thus enhancing the body's skeletal pump efficiency. The home exercises were reviewed each week to monitor adherence and to discuss progressions and adaptations. We were pragmatic, and if this amount was not achievable, we decreased the progressions or home exercise frequency.

As sessions progressed, goals were modified to: increase strength (in particular legs and core), develop cardiovascular fitness, improve RoM in the hips, resolve lower back pain, and enhance stability in the shoulder girdle. There were also challenges that needed to be overcome related to time management, fatigue, and monitoring POTS symptoms before, during and after exercise. To help during exercise, the medical consultant prescribed vasoconstriction medication which was taken before exercise.

Evaluating the Intervention

The WHOQOL-BREF was administered at baseline (week 0), week 8 at the end of the combined intervention, and week 12. We also documented exercise adherence. Table 2 shows the domain scores for the WHOQOL-BREF, plus the two general life and health satisfaction questions similar to the format reported by Tito and Hess (2017). Furthermore, we have included change as percentage from baseline to week 12.

Table 2. WHOQOL-BREF scores by domain and time point.

Domain	**Baseline (week 0)**	**Week 8**	**Week 12**	**Change %**
1. Physical health*	19	44	44	57.14
2. Psychological*	44	56	56	18.18
3. Social relationships*	25	44	44	37.50
4. Environment*	44	69	56	18.18
Q1. How satisfied are you with your life?**	2	4	4	100.00
Q2. How satisfied are you with your health?**	2	2	2	0.00

*range of scores for each domain is 0-100
**range for each individual question is 1-5

The physical and environmental domains had the highest improvement from baseline to week 8 with increases at 53.8% and 31.8% respectively. Exercise adherence at week 8 was reported as a mean average of 83% based on three sessions per week for eight-weeks which saw 20 out of 24 sessions completed.

Before exercise was completed at week 8, the psychologist interviewed R.L. She discussed how the program had made her feel “less isolated…physically and mentally healthier and stronger”. She went on to say: “before the intervention when I passed out it would leave me feeling unwell for a week or more, but now I feel more in control. If it does happen, I just dust myself off and get on with it”. When asked to give feedback for future developments of the POTS program, R.L. said that the social interaction and having a team that cared about her “specific needs” was motivating alone. Beyond the intervention R.L. planned to continue exercising with a personal trainer, with the new aim to independently run.

Comparing week 8 to week 12, there was a 4.9% drop in total QOL with the environmental domain performing the worst at -13.8%, and the psychological domain the best with an increase of 5%. Overall, comparing total QOL baseline scores to week 12, there was a 27.9% increase. All domain scores: physical (46.2%), psychological (25%), social relationships (33.3%), and environmental (13.6), increased with specific questions showing no change for health (Q2), but a 100% increase for life satisfaction (Q1). The smaller variation between in the scores can also be associated by the test-retest reliability (von Steinbüchel, Lischetzke, Gurny, & Eid, 2006). At week 12, an exit interview was conducted, and R.L. stated that the intervention: “gave me the confidence to exercise”, but from week 10 there was a “decrease in using imagery because I felt back to my normal self”. Therefore, bi-weekly booster sessions could be of benefit.

Approximately 16-weeks after the study finished (28-weeks from week 1), we contacted R.L. and were informed that she is continuing to exercise, although less regularly than when under supervision, and hopes to get back in the gym post COVID-19. She informed us that she has decreased the use of medications including antidepressants but continues to have good and bad days, stating: “the bad days are now very few, and a great deal more manageable”. The current exercises conducted at home were from the study (or small adaptations), and small self-administered lifestyle modifications such as walking at least 10,000 steps daily were being completed 20-weeks post intervention.

Reflections and Recommendations

We tried to approach challenges with reactive solutions driven partly by R.L. We knew that the exercise program would have to be specific to the assessments, and the progression of the sessions could be generally planned but were required to be

flexible due to the nature of POTS. The home exercise program was encouraged but again adapted to suit the reality of home training, including exercises that limited the potential for tachycardia and risk of falls. Additional challenges such as fatigue levels, loss of motivation, and time constraints, were overcome with positive dialogue, reinforcement of goals and a program that required just one weekly attendance for supervised sessions.

An initial issue occurred in week one. R.L wore a HR monitor during the session constantly checking her HR, which exacerbated exercise anxiety elevating her HR. Therefore, the psychologist and R.L. immediately left the laboratory and FIT was delivered through a brisk walk around the institution grounds. This became the initial method of delivery as it enabled the psychologist to review goals, help with imagery specific practice, and answer questions, whilst exercising and decreasing anxiety. However, this meant that no booster sessions were recorded in their entirety. A HR monitor was not worn again during exercise sessions, and although HR was often checked when using static equipment, most feedback was subjective through RPE.

The main challenge with the FIT intervention was initially reminding R.L. to use the cue as her activating process that commences imagery. Imagery use, precisely motivation general mastery (see Paivio, 1985) was slow to start. R.L. could imagine achieving her exercise goal, but verbally reported limited positive self-imagery. The booster sessions were mutually beneficial at disseminating imagery application and three topics arose during conversations; examine goals and cues, explore opportunities to solve problems and overcome negative thoughts, and feedback on how to optimise vividness and controllability. We suggest that FIT imagery booster sessions use these three topics as the minimum requirement as it promotes learning and motivational goals.

Adjusting medication, work commitments and dietary patterns to fit into the intervention was challenging for R.L. The medical consultant prescribed the best medication to his knowledge to help with the incremental exercise program, and work was compassionate allowing flexible working hours. Eating habits were self-adapted to offset the increased energy expenditure resulting from exercise.

As an interdisciplinary team our main challenge was in meeting together, reviewing notes and developing a combined plan after week two. All nine members of the interdisciplinary team involved in the project met after the initial interview and assessments, then failed to meet together again. To maintain continuity weekly notes were circulated and generally all parties responded inputting into the following weeks program.

The aim of this study was to enhance the QOL through psychological and physiological interventions. To do this we collaboratively set out specific goals, which were modified based on achievement by R.L. and the research team. The initial goal of jogging five-minutes was completed in week three after a series of small setbacks and achievements, then goals evolved quickly which saw an observable change in R.L. She was more talkative, upbeat and seemed confident, setting more challenging goals such as jogging for 20-minutes. The overall increase in QOL due to the intervention at week eight, we feel, was due to the combination of psychological and physiological support, which assisted with the increase in confidence to exercise. Whilst it would be beneficial to complete larger studies comparing the combined or independent use of psychological and physiological interventions, there are clear benefits to using a holistic individualised approach. A key benefit is the consistency in scores from week 8 to 12 which demonstrate maintained QOL when support is

removed. We recommend that future researchers include periodic FIT booster support sessions after the intervention to support motivation through imagery use.

Conclusion

Within our specific professions we are experienced in collaborative structures and because of our person-centred approach, we assumed little about R.L.'s condition before completing assessments. POTS is complex and the training program included is only a rough guide for practitioners. Generic exercise suggestions for POTS (Fu et al., 2011; Richardson et al., 2017) such as interval training would not have worked for R.L. in the first few weeks, so we suggest a collaborative approach that engages the specialists and client in mutual conversations that are focused on tangible goals.

We were very fortunate to have the expertise available and acted promptly to get the project underway. Applying neutrality, an essential skill for FIT, to this project was perhaps the most challenging part. We tried not to show emotion from R.L.'s highs and lows during setbacks and achievements, but we developed a connection as we learned from her. Motivational interventions such as MI and FIT focus on unambiguous goals, which as practitioners we fully engage in. These goals are client-centred, and team driven through mutual processes, resulting in behaviour change from us all. We recommend that practitioners who work with individuals that have low self-efficacy become trained in motivational goal setting. This creates a learning environment that cultivates empathy and autonomy, key factors for improving QOL. Overall, we supported R.L. by rekindling the enjoyment she once had whilst participating in health and exercise activities and were able to collaboratively support behavioural change by increasing intrinsic motivation.

References

Agarwal, S. K. (2012). Cardiovascular benefits of exercise. *International Journal of General Medicine, 5*, 541. doi:10.2147/IJGM.S30113

Anderson, J. W., Lambert, E. A., Sari, C. I., Dawood, T., Esler, M. D., Vaddadi, G., & Lambert, G. W. (2014). Cognitive function, health-related quality of life, and symptoms of depression and anxiety sensitivity are impaired in patients with the postural orthostatic tachycardia syndrome (POTS). *Frontiers in Physiology, 5*, 230. doi:10.3389/fphys.2014.00230

Andrade, J., Khalil, M., Dickson, J., May, J., & Kavanagh, D. J. (2016). Functional Imagery Training to reduce snacking: Testing a novel motivational intervention based on Elaborated Intrusion theory. *Appetite, 100*, 256-262. doi:10.1016/j.appet.2016.02.015

Bhaskar, R. (2013). *A realist theory of science.* Routledge, London, UK.

Borg, G. A. (1982). Psychophysical bases of perceived exertion. *Medicine & Science in Sports & Exercise, 14*(5), 377-381. doi:10.1249/00005768-198205000-00012

Campbell, A., & Hausenblas, H. A. (2009). Effects of exercise interventions on body image: A meta-analysis. *Journal of Health Psychology, 14*(6), 780-793. doi:10.1177/1359105309338977

Conner, R., Sheikh, M., & Grubb, B. (2012). Postural orthostatic tachycardia syndrome (POTS): Evaluation and management. *British Journal of Medical Practice, 5*(4), 540.

De Moor, M. H. M., Beem, A. L., Stubbe, J. H., Boomsma, D. I., & De Geus, E. J. C. (2006). Regular exercise, anxiety, depression and personality: a population-based study. *Preventive medicine, 42*(4), 273-279. doi:10.1016/j.ypmed.2005.12.002

Duckworth, A. L., Kirby, T. A., Gollwitzer, A., & Oettingen, G. (2013). From fantasy to action: Mental contrasting with implementation intentions (MCII) improves academic performance in children. *Social Psychological and Personality Science, 4*(6), 745-753. doi:10.1177/1948550613476307

Flack, T., & Fulton, J. (2018). Quality of life in postural orthostatic tachycardia syndrome (PoTS): before and after treatment. *British Journal of Cardiology, 25*, 140-142.

Fu, Q., & Levine, B. D. (2018). Exercise and non-pharmacological treatment of POTS. *Autonomic Neuroscience, 215*, 20-27. doi:10.1016/j.autneu.2018.07.001

Fu, Q., VanGundy, T. B., Shibata, S., Auchus, R. J., Williams, G. H., & Levine, B. D. (2011). Exercise training versus propranolol in the treatment of the postural orthostatic tachycardia syndrome. *Hypertension, 58*(2), 167-175. doi:10.1007/s10286-010-0091-5

Galbreath, M. M., Shibata, S., VanGundy, T. B., Okazaki, K., Fu, Q., & Levine, B. D. (2011). Effects of exercise training on arterial-cardiac baroreflex function in POTS. *Clinical Autonomic Research, 21*(2), 73-80. doi:10.1007/s10286-010-0091-5

Gholami, A., Jahromi, L. M., Zarei, E., & Dehghan, A. (2013). Application of WHOQOL-BREF in measuring quality of life in health-care staff. International journal of preventive medicine, 4(7), 809.

Kavi, L., Gammage, M. D., Grubb, B. P., & Karabin, B. L. (2012). Postural tachycardia syndrome: multiple symptoms, but easily missed. *British Journal of General Practice, 62*(599), 286-287. doi:10.3399/bjgp12X648963

Kizilbash, S. J., Ahrens, S. P., Bruce, B. K., Chelimsky, G., Driscoll, S. W., Harbeck-Weber, C., ... & Pianosi, P. T. (2014). Adolescent fatigue, POTS, and recovery: a guide for clinicians. *Current Problems in Paediatric and Adolescent Health Care, 44*(5), 108-133. doi:10.1016/j.cppeds.2013.12.014

Lang, P. J. (1979). A bio-informational theory of emotional imagery. *Psychophysiology, 16*(6), 495-512. doi:10.1111/j.1469-8986.1979.tb01511.x

Miller, W. R., & Rollnick, S. (2012). *Motivational interviewing: Helping people change*. Guilford press.

Moon, J., Kim, D. Y., Byun, J. I., Sunwoo, J. S., Lim, J. A., Kim, T. J., ... & Park, K. I. (2016). Orthostatic intolerance symptoms are associated with depression and diminished quality of life in patients with postural tachycardia syndrome. *Health and Quality of Life Outcomes, 14*(1), 144. doi:10.1186/s12955-016-0548-x

Paivio, A. (1985). Cognitive and motivational functions of imagery in human performance. Canadian journal of applied sport sciences. *Journal Canadien des Sciences Appliquées au Sport, 10*(4), 22S-28S.

Pal, S., Radavelli-Bagatini, S., & Ho, S. (2013). Potential benefits of exercise on blood pressure and vascular function. *Journal of the American Society of Hypertension, 7*(6), 494-506. doi:10.1016/j.jash.2013.07.004

Raj, S. R. (2013). Postural tachycardia syndrome (POTS). *Circulation, 127*(23), 2336-2342. doi:10.1161/CIRCULATIONAHA.112.144501

Richardson, M. V., Nordon-Craft, A., & Carrothers, L. (2017). Using an exercise program to improve activity tolerance in a female with postural orthostatic tachycardia syndrome: a case report. *Physiotherapy Theory and Practice, 33*(8), 670-679. doi:10.1080/09593985.2017.1328719

Rhodes, J., May, J., Andrade, J., & Kavanagh, D. (2018). Enhancing grit through functional imagery training in professional soccer. *The Sport Psychologist, 32*(3), 220-225. doi:10.1123/tsp.2017-0093

Rorty, R. (1991). The priority of democracy to philosophy. *Objectivity, relativism, and truth: Philosophical papers, 1*, 175-196.

Schondorf, R., Benoit, J., Wein, T., & Phaneuf, D. (1999). Orthostatic intolerance in the chronic fatigue syndrome. *Journal of the Autonomic Nervous System, 75*(2-3), 192-201. doi:10.1016/S0165-1838(98)00177-5

Sharma, A., Madaan, V., & Petty, F. D. (2006). Exercise for mental health. *Primary Care Companion to the Journal of Clinical Psychiatry*, *8*(2), 106-106. doi:10.4088/pcc.v08n0208a

Shibata, S., Fu, Q., Bivens, T. B., Hastings, J. L., Wang, W., & Levine, B. D. (2012). Short-term exercise training improves the cardiovascular response to exercise in the postural orthostatic tachycardia syndrome. *The Journal of Physiology, 590*(15), 3495-3505. doi:10.1113/jphysiol.2012.233858

Smith, D. E., Heckemeyer, C. M., Kratt, P. P., & Mason, D. A. (1997). Motivational interviewing to improve adherence to a behavioral weight-control program for older obese women with NIDDM: a pilot study. *Diabetes Care, 20*(1), 52-54. doi:10.2337/diacare.20.1.52

Solbrig, L., Whalley, B., Kavanagh, D. J., May, J., Parkin, T., Jones, R., & Andrade, J. (2019). Functional imagery training versus motivational interviewing for weight loss: a randomised controlled trial of brief individual interventions for overweight and obesity. *International Journal of Obesity, 43(4),* 883-894. doi:10.1038/s41366-018-0122-1

Tito, C., & Hess, J. B. (2017). Aquatic Therapy for a Patient with Postural Orthostatic Tachycardia Syndrome: a Case Report. *Internet Journal of Allied Health Sciences and Practice, 15*(3), 10.

von Steinbüchel, N., Lischetzke, T., Gurny, M., & Eid, M. (2006). Assessing quality of life in older people: psychometric properties of the WHOQOL-BREF. *European Journal of Ageing, 3*(2), 116-122. doi:10.1007/s10433-006-0024-2

Whoqol Group. (1995). The World Health Organization quality of life assessment (WHOQOL): position paper from the World Health Organization. *Social science & medicine, 41*(10), 1403-1409. doi:10.1016/0277-9536(95)00112-K

Williams, S. E., Cooley, S. J., & Cumming, J. (2013). Layered stimulus response training improves motor imagery ability and movement execution. *Journal of Sport and Exercise Psychology*, 35(1), 60-71. doi:10.1123/jsep.35.1.60

Winker, R., Barth, A., Bidmon, D., Ponocny, I., Weber, M., Mayr, O., ... & Haber, P. (2005). Endurance exercise training in orthostatic intolerance: a randomized, controlled trial. *Hypertension, 45*(3), 391-398. doi:10.1161/01.HYP.0000156540.25707.af

World Health Organization. (1997). Measuring quality of life: The World Health Organization quality of life instruments (the WHOQOL-100 and the WHOQOL-BREF). *WHOQOL-measuring quality of life*.